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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/914,305	08/27/2001	Tiziano Dall'Occo	US 18024	3720

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EXAMINER

LEE, RIP A

ART UNIT	PAPER NUMBER
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1713

DATE MAILED: 09/23/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/914,305

Applicant(s)

DALL'OCCO ET AL.

Examiner

Rip A. Lee

Art Unit

1713

-- Th MAILING DATE of this communication appears on the cover sheet with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 July 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7, 9-21 and 23-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-20 and 23-27 is/are rejected.
- 7) ☒ Claim(s) 21 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This office action follows a response filed on July 19, 2002 in which claims 1, 2, 4, 6, 9-10, 16-21, and 23-27 were amended. Notably, claims 1, 16, 25, and 26 were amended to recite a further restriction that at least one of substituents R^1 , R^2 , R^3 , R^4 , R^7 or R^8 is not hydrogen. Claims 18-20, 23, and 27 were amended to recite a further restriction that R^7 and R^8 exclude hydrogen. Claims 8 and 22 were canceled.

Claim Objections

1. Claim 1 is objected to because of the following informalities: Compound B is recited to be “able” to perform several tasks (three occurrences), for instance, “able to give a proton and react irreversibly with a substituent X.” The use of “able” lends uncertainty to the claim. Either compound B performs said chemical transformation or it does not. If it does not, then the claimed polymerization process does not work either.

As an example, Brønsted acid $[\text{Ph}_3\text{NH}][\text{B}(\text{C}_6\text{F}_5)_4]$ theoretically is able to donate a proton, and it does so with small bases such as NaOH, but it is too bulky to donate a proton to the Lewis basic X ligand of the claimed metallocenes. Simple revision of the claim to exclude the word “able” is suggested, *i.e.*, “which gives a proton and reacts irreversibly with substituent X.” Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 19 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Structures (VIII) and (IX) lack bromine groups in the 2-position which are required for the coupling mechanism described in step (iv).

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite because it contains improper Markush language. As indicated in the previous office action (Paper No. 6), it is unclear whether the process requires one of each type (*i.e.*, one alumoxane and one compound) or one from the group consisting of alumoxane and compound (*i.e.*, use of either alumoxane or compound alone is acceptable).

The Applicant's indicate that the phrase "at least one of an alumoxane and a compound of formula DE" means that compound B is either (i) an alumoxane, (ii) a compound DE, or (iii) an alumoxane and DE. This is not true, despite "common usage."

First, “alumoxane” and “compound of formula DE” both represent a genus of compounds of which there are several species. Secondly, the conjunction “and” means both genus must be considered. Thus, B must be at least one species from the genus alumoxane *and* at least one species from the genus of compound of formula DE. Since “and” is not equivalent grammatically to “or,” there is no provision for the options suggested by the Applicants. That the confusion exists is the very reason why Markush groups are used in claim language. Simple revision is suggested.

6. Claims 1 (three occurrences), 16 (five occurrences), 18 (two occurrences), 19 (two occurrences), 20 (two occurrences), 23 (four occurrences), 25 (three occurrences), 26 (two occurrences), and 27 (two occurrences) are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. As pointed out in the previous office action, the claim that substituents “optionally contain heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements” is vague and indefinite because the number and type of heteroatom, and manner in which the heteroatom is incorporated into the overall compound is not disclosed adequately.

The Applicants conclude that the language of the claims is not indefinite because it has been used in granted U.S. patents. Upon cursory review of the claims in the ten patents cited by the Applicants, one arrives at the conclusion that the language therein is also vague and indefinite. That an item is in print does not automatically render it clear and definite. Rather, the vagueness has merely been perpetuated.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-7, 9-12, 16, 17, and 24-26 are rejected under 35 U.S.C. 102(b) as being anticipated by WO98/22486 to Ewen *et al.*

Ewen *et al.* discloses a process for polymerization of an addition polymerizable monomer (claim 13) in which the process is used for the production of polyethylene, propylene, or copolymers thereof (claim 19). Catalysts derived from compounds such as isopropylidene (3-alkylcyclopentadienyl)(7-cyclopentadithiophene)zirconium dichloride and MAO are adequately disclosed (page 15-16). Use of activators such as alcohol-B(C₆F₅)₃ complexes and triphenylcarbenium boronates is also discussed (page 72).

According to claims 9-11 of Ewen *et al.*, the metallocenes of the invention possess bilateral symmetry, or they are asymmetric, thereby necessitating the conditions of the present claims that “at least one of substituents R¹, R², R³, R⁴, R⁷ or R⁸ is not hydrogen.” As further support for this notion, the text described the preparation of the ligand set from 6,6-disubstituted fulvalenes with substituents in the 3- and 4-positions (page 76). Note also that structures [g] and [l] on page 36 also include substituents R_n and R_m such that C₂ or C_s symmetric metallocenes may be prepared.

The steps involved in the synthesis of the ligand outlined in Example 6 are identical to those steps recited in present claims 16 and 17, namely, deprotonation of the heterocycle with a

base such as alkyllithium, reaction with fulvalene, and subsequent quenching with proton source such as ammonium chloride. In sum, the present claims are anticipated fully by Ewen *et al.*

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

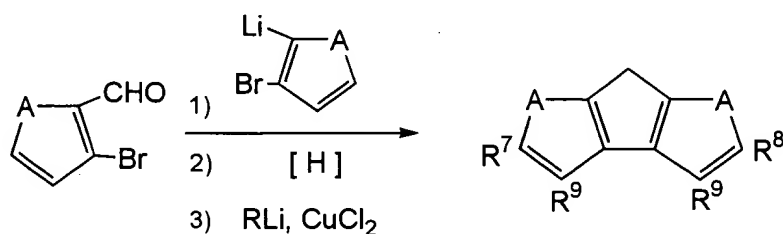
1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO98/22486 to Ewen *et al.* in view of U.S. Patent No. 5,948,873 to Santi *et al.* for the same reasons set forth in the previous office action.

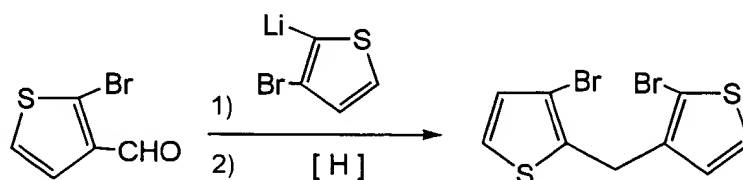
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12. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kraak *et al.* (*Tetrahedron* 1968)

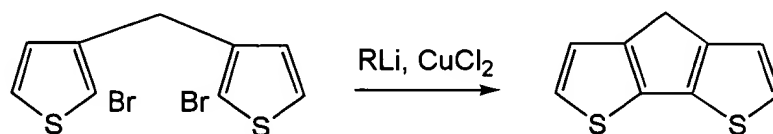
The claim is drawn to the synthesis of compound (VII) in which substituents R^7 and R^8 are not hydrogen. The basic elements of the claim, depicted in reaction sequence format, are shown in the scheme below (substituents R^7 , R^8 , and R^9 omitted in precursors for clarity).



The prior art of Kraak *et al.* discloses general synthetic methods for the preparation of cyclopentadithiophenes. Scheme 3 of the reference illustrates the addition/reduction sequence for the following isomer.



Ring closure using two equivalents of *n*-BuLi and CuCl₂ is illustrated in Scheme 1 for the 7H-cyclopenta[1,2b:3,4-b']dithiophene isomer.



While the reference does not show specifically an example for the synthesis of the 7*H*-cyclopenta[1.2*b* : 4.3-*b'*]dithiophene isomer of the present claims, or substituted derivatives thereof, one having skill ordinary skill in the art would have found it obvious to arrive at the present claims because the general synthetic steps are adequately disclosed in the reference.

It would be obvious to use the above reaction steps for the preparation of the 7*H*-cyclopenta[1.2*b* : 4.3-*b'*]dithiophene because this is discussed generally (see structure I) along with other cyclopentadithiophene isomers. One would be motivated to modify the coupling step shown in the reaction sequence on page 3382 (also referenced in *J. Org. Chem.* 1964, 29, 2455), because the lithiation method described in the current reference affords dithienylmethanes in much higher yield. Finally, one with skill in the art would recognize that simple alkyl substituents would not affect the mechanism of the above general reactions. Thus, one would find it obvious to use the same procedure to make substituted cyclopentadithiophenes with a reasonable expectation of success.

13. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kraak *et al.* in view of Elschenbroich *et al.*

The present claim is drawn to a process for preparation of 7*H*-cyclopenta[1.2*b* : 3.4-*b'*]dithiophene *via* the steps (i) addition of a thienyllithium derivative to a thiophene aldehyde, (ii) reduction of the resulting 3,3'-dithienyl carbinol to the corresponding dithienylmethane, and (iii) coupling to form the tricyclic compound using *n*-BuLi/TMEDA/CuCl₂.

Scheme 1 of Kraak *et al.* shows preparation of 7*H*-cyclopenta[1.2*b* : 3.4-*b'*]dithiophene using both reduction and coupling steps described in the instant claims. The only difference

between step (iii) of the instant claims and the corresponding step of Kraak *et al.* is the use of TMEDA. Although this is not shown in the prior art, its use with alkyllithiums is well established. As shown in Elschenbroich *et al.*, it is well known that alkyllithium compounds exist as aggregates. It is also known to those in the art that TMEDA is used to break up these aggregates in order to enhance the rate of alkyllithium mediated metalation reactions (see pages 19-29). Therefore, one would have found it obvious to one having ordinary skill in the art to use TMEDA in the lithiation step of Kraak *et al.* as well, and one would expect such a modification to work. Motivation to modify the prior art process arises from the consistently low yields reported for the coupling step (*i.e.*, 35 % yield for the claimed compound; see page 3382).

Kraak *et al.* does not show the first step of addition of a thienyllithium derivative to a thiophene aldehyde in Scheme 1. Nonetheless, this step is shown clearly in Scheme 3. Even though the scheme shows preparation of an isomer of the claimed compound, one having skill in the art found would have found it obvious to arrive at the claims of the present invention *via* the teachings of the prior art. One would be motivated to use addition of a thienyllithium derivative to a thiophene aldehyde as described in the current reference because this process affords dithienylmethanes in much higher yield.

Finally, one notes that the preparation of substituted cyclopentadithiophenes is not shown in the reference. However, one would recognize that simple alkyl substituents would not affect the mechanism of the above general reactions. Thus, one would find it obvious to use the same procedure to make substituted cyclopentadithiophenes with a reasonable expectation of success.

Allowable Subject Matter

14. Claim 21 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

15. Claims 20, 23, and 27 would be allowable if revised to overcome the rejections under 35 U.S.C. 112, second paragraph set forth in paragraph 6 of this office action.

16. The following is a statement of reasons for the indication of allowable subject matter: Claims 20, 23, and 27 would be allowable over the closest reference, Kraak *et al.* (*Tetrahedron* 1968). The reference does not teach the synthetic steps outlined in the present claims. It would not be obvious to arrive at the present claims from the teachings of the prior art.

Status of Claim Rejections

17. All previous claim objections have been withdrawn. The rejection of claim 1 under 35 U.S.C. 112, first paragraph has been withdrawn due to amendment of the claim. Rejections under 35 U.S.C. 112, second paragraph set forth in paragraphs 14, 15, and 17-22 no longer apply due to appropriate amendment of claims.

18. The rejection of claims 1-7, 10-12, 16 and 17 under 35 U.S.C. 102(b) as being anticipated by Ewen *et al.* (*J. Am. Chem. Soc.* 1998) has been overcome by amendment. Subsequently, the rejection has been withdrawn.

19. The rejection of claims 18 and 24 under 35 U.S.C. 102(b) as being anticipated by Kraak *et al.* has been overcome by amendment. Subsequently, the rejection has been withdrawn.

20. The rejection of claims 8 and 9 under 35 U.S.C. 103(a) as being unpatentable over WO98/22486 to Ewen *et al.* in view of 5,198,401 to Turner *et al.* has been withdrawn.

21. The rejection of claims 25 under 35 U.S.C. 103(a) as being unpatentable over WO98/22486 to Ewen *et al.* has been withdrawn.

22. The rejection of claims 16, 17, and 26 under 35 U.S.C. 103(a) as being unpatentable over Kraak *et al.* has been withdrawn.

Response to Arguments

23. The Applicants traverse the rejection of claims 1-7, 10-12, 16, and 17 under 35 U.S.C. 102(b) as being anticipated by WO98/22486 to Ewen *et al.* The Applicant's arguments have been considered fully, but they are not persuasive.

The Applicants submit that Ewen *et al.* does not teach compounds which satisfy the requirement that at least one of substituents R¹, R², R³, R⁴, R⁷ or R⁸ is not hydrogen. The Applicants submit further that the reference does not describe the specific class of compounds used in the polymerization of ethylene because the only example of ethylene polymerization is Example 7, where the compound isopropylidene(cyclopentadienyl)(7-cyclopentadithiophene)zirconium dichloride is used.

As discussed in paragraph 8, compounds such as isopropylidene (3-alkylcyclopentadienyl)(7-cyclopentadithiophene)zirconium dichloride are fully disclosed in the reference. Use of corresponding 4-alkylcyclopentadienyl derivatives is also contemplated, as is the use of substituted cyclopentadithiophenes. Claim 19 of Ewen *et al.* is clearly drawn to use of the inventive compounds for the preparation of polyethylene, *inter alia*.

24. The Applicants traverse the rejection of claims 25 under 35 U.S.C. 102(b) as being anticipated by WO98/22486 to Ewen *et al.* The Applicant's arguments have been considered fully, but they are not persuasive.

The Applicants maintain that the reference does not teach the substituted metallocene compounds of the invention. As indicated in paragraph 8 and above, substituted metallocenes are fully discussed in the patent. To iterate, "According to claims 9-11 of Ewen *et al.*, the metallocenes of the invention possess bilateral symmetry, or they are asymmetric, thereby necessitating the conditions of the present claims that "at least one of substituents R^1 , R^2 , R^3 , R^4 , R^7 or R^8 is not hydrogen." As further support for this notion, the text described the preparation of the ligand set from 6,6-disubstituted fulvalenes with substituents in the 3- and 4-positions (page 76). Note also that structures [g] and [l] on page 36 also include substituents R_n and R_m such that C_2 or C_s symmetric metallocenes may be prepared."

In view of the discussion herein, the rejections of record have not been withdrawn.

25. The Applicants traverse the rejection of claims 13-15 under 35 U.S.C. 103(a) as being unpatentable over WO98/22486 to Ewen *et al.* in view of U.S. Patent No. 5,948,873 to Santi *et al.* The Applicant's arguments have been considered fully, but they are not persuasive.

The Applicants submit that Ewen *et al.* does not teach the claimed subject matter and that Santi *et al.* does not remedy the deficiencies of Ewen *et al.*, especially since the metallocenes of Santi *et al.* are completely different.

As shown above, the claimed subject matter is anticipated by the prior art. The Santi *et al.* reference was not invoked to make up for any deficiency in Ewen *et al.* In fact, the catalysts described therein work quite well. Although the reference teaches copolymerization of ethylene with α -olefins, it is silent with respect to copolymerizations with cyclic olefins. This is not a novel concept. Even though the reference does not suggest this embodiment, one with skill in the catalyst art would find it obvious to arrive at this notion, especially when such a process is shown in Santi *et al.*

In view of the discussion above, the rejection of record has not been withdrawn.

26. The Applicants traverse the rejection of claim 19 under 35 U.S.C. 103(a) as being unpatentable over Kraak *et al.* in view of Elschenbroich *et al.* The Applicant's arguments have been considered fully, but they are not persuasive.

The Applicants maintain that Kraak *et al.* discloses unsubstituted cyclopentadithiophenes only and that the reference does not teach the claimed metallocene ligands. As further support for their argument, the Applicants submit that Elschenbroich *et al.* does not remedy deficiencies in Kraak *et al.*, presumably because it does not discuss cyclopentdithiophenes.

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It is clear that Kraak *et al.* does not teach synthesis of substituted cyclopentadithiophenes. However, the position that one would find it obvious to use the procedures described therein to make substituted cyclopentadithiophenes with a reasonable expectation of success (see paragraph 19) is maintained. That Elschenbroich *et al.* ignores cyclopentadithiophenes is irrelevant. The issue at hand is whether it would be obvious to use TMEDA in conjunction with *n*-BuLi. There is motivation to use TMEDA because it is well known to use the base to break up aggregates of alkylolithiums, thereby enhancing the rate of the metalation reaction. Contrary to what the Applicants believe, one would reasonably expect this modification to remedy the typically low yields observed in Kraak *et al.* In contrast to cogent reasoning set forth in the rejection, the Applicants have not shown why it would not be obvious to use TMEDA. Therefore, the rejection of record has not been withdrawn.

Conclusion

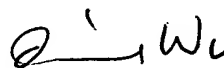
27. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rip A. Lee whose telephone number is (703)306-0094. The examiner can be reached on Monday through Friday from 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached at (703)308-2450. The fax phone number for the organization where this application or proceeding is assigned is (703)746-7064. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0661.



DAVID W. WU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

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September 18, 2002